Artificial Lighting for Poultry Houses

by

R. E. Cray

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Possible Results of Lighting

1. Lights will increase winter production.
2. Lights will have a tendency to increase yearly production.
3. Lights will hasten breeders into production.
4. Lights will largely prevent the winter molt of early hatched pullets.
5. Lights will hasten maturity of late hatched pullets.
6. Lights used on culls will increase the fall and winter production.
7. Lights properly used will materially increase the labor income.

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By
R E CRAY
Specialist in Poultry Husbandry,
The Ohio State University

ARTIFICIAL LIGHTING to increase egg production, at least during the season of high prices, is fundamentally sound and has great potential possibility.

The long nights during the fall and winter months leave the hen only about half the time that summer days permit in which to consume feed. By the sensible use of lights during this season, the long periods of idleness are broken up and the bird is given a longer day in which to consume feed and is aided thus to lay eggs during the months of unfavorable weather conditions. In this way the hens are induced to lay when eggs are normally highest in price and the labor income per hen is materially increased.

As is true with any practice which gives such spectacular results as artificial illumination, careless or thoughtless management will react in a disastrous way. If the principles of the use of artificial illumination on the control of egg production are fully understood, poultrymen will realize that it is a benefit and not a detriment to their birds. Troubles experienced as a result of artificial illumination are due to its abuse, and not its use.

METHODS OF USING LIGHTS

There are four distinct systems of using lights to increase egg production. There is no great difference in the results secured by the various systems. The selection of a system of lighting should be made largely on the basis of convenience to the operator.

The Morning and Evening System—This method of lighting has one particular advantage over the other methods in that the operator can have control over the changing periods of twilight and dawn, and variation in the amount of light from day to day due to climatic conditions, thus giving the birds a uniform day and a uniform night the entire winter season. This system makes an even amount of time between breakfast and supper and makes it possible for the bird to get her food and exercise with regularity.

The Morning Light System—This method of lighting requires no dimming device, and the operator is always at home when the lights are used. These points, coupled with the fact that the light is given when the bird is rested and cold promotes more exercising on the part

of the bird, particularly if the grain is fed in deep litter. This system is very generally used on dairy farms where the operator is up early to care for the dairy.

The Evening Light System—This system of continuing the length of the day insures the birds having ample time to fill their crops before going to roost. It also makes the days end uniformly.

The Evening Lunch System—This system breaks up the long period between night and morning feeding by giving them an hour of light around 9 p. m. It also gives the birds opportunity to get ample feed without losing much sleep. The cost of operation is less, and the results secured are about the same as with other methods of lighting. Dimming devices must be used with this plan to turn off the lights.

The comparison of the various methods of lighting given in Table 2 is not wholly fair, because the percentage of old hens under the evening lunch method was much greater than with the other methods.

WHAT LIGHTS WILL DO

In starting the use of lights on the poultry flock, it is well to know definitely what results to expect. The use of lights is so closely linked with good stock and proper management, and especially correct feeding, that the results obtained will vary with the individual owner and individual flock.

The results of studies in this state and others warrant the following very definite conclusions:

1. Lights properly used will materially increase both the winter and yearly egg production of pullets and hens. However, lights should not be used during the winter on hens to be used for breeding purposes.

2. Hens kept for breeding purposes can be hastened back in production by limited use of lights from January 15 until March without any apparent effect on hatchability of eggs.

3. Lights make it possible to carry early hatched pullets through the first fall and winter production period with much less molting than when lights are not used.

4. Fall production of the laying flock can be maintained at a much higher plane by the use of lights from September 1 to November 1. (If birds are to be used for breeders the following spring the lights should be discontinued abruptly on November 1 and the flock thrown into a molt in order to give sufficient rest before the next hatching season.)

EFFECT OF LIGHTS ON YEARLY EGG PRODUCTION

The following table shows a comparison of egg production per bird between flocks managed under lights and those managed without the use of lights. These data are taken from the records kept on 756 Ohio calendar flocks.

The average size of the flocks under lights was somewhat larger than those that did not use lights. While it is generally agreed that lights increase the winter egg production, these data indicate that lights also materially increased yearly production.

TABLE 1—COMPARISON OF EGG PRODUCTION PER BIRD IN FLOCKS MANAGED WITH AND WITHOUT LIGHTS

Month	189 Flocks—Lights			567 Flocks—No Lights		
	Total number birds	Average size flock	Average egg production per bird	Total number birds	Average size flock	Average egg production per bird
Nov.	60,701	321	4.6	99,225	175	3.1
Dec.	59,816	316	6.6	96,912	171	4 2
Jan.	58,762	311	8.5	94,449	167	5.8
Feb.	57,213	303	11.9	92,737	164	9.6
Mar.	55,606	294	16.6	90,476	159	16.2
April	52,570	279	18 1	87,425	154	18.4
May	49,672	263	17.6	83,169	147	17.0
June	46,839	248	15.1	77,633	137	14.2
July	42,697	226	14.7	71,417	126	13.7
Aug.	37,281	197	13.3	65,296	115	12.7
Sept.	32,604	172	9.7	59,729	107	10.2
Oct.	28,563	151	5.7	54,061	95	6.2
Ave.	48,527	257	142.4	81,044	143	131.3
Percent reduction in size of flocks.		53			45.7	

EFFECTS OF LIGHTS ON PULLETS

When the pullets are housed they should be placed in pens according to maturity; those birds of about the same size and comb development should be placed together. This is essential, as the management of mature birds differs greatly from the management of immature pullets.

Early Maturing Pullets—The early maturing birds of a flock all of the same age and reared under the same conditions constitute the better birds of the flock. These birds need lights in order to give them

TABLE 2—COMPARING RESULTS OF DIFFERENT METHODS OF USING LIGHTS

Month	Morning and Evening Lights 32 Flocks			Morning Lights 122 Flocks			Evening Lights 15 Flocks			Evening Lunch 20 Flocks		
	Total number birds	Average size flock	Ave. egg prod. per bird	Total number birds	Average size flock	Ave. egg prod. per bird	Total number birds	Average size flock	Ave. egg prod. per bird	Total number birds	Average size flock	Ave. egg prod. per bird
Nov.	8,864	277	5.1	38,941	319	4.6	3,833	255	5.2	9,063	453	3.6
Dec.	8,768	274	7.1	38,501	315	6.4	3,799	253	7.8	8,748	437	6.5
Jan.	8,450	264	9.2	38,172	313	8.4	3,687	246	9.0	8,453	422	7.4
Feb.	8,233	257	11.8	37,220	305	12 1	3,643	243	13.5	8,117	405	10.6
Mar.	7,909	247	16.2	36,366	298	16.8	3,501	233	16.4	7,830	391	16 2
Apr.	7,556	236	18.4	34,566	283	18.2	3,283	219	17 8	7,165	353	17.8
May	6,811	213	18.2	32,803	270	17.6	3,171	211	17.4	6,887	344	16 9
June	6,660	208	15.7	30,833	253	15.1	3,073	205	14.0	6,273	314	14.5
July	6,152	192	15.8	28,201	231	14.7	2,787	186	13.5	5,557	278	14.0
Aug.	5,640	176	13.8	23,918	197	13.5	2,570	171	12.1	5,153	253	12.4
Sept.	4,904	153	9.7	20,995	172	9.9	2,236	149	9.3	4,469	223	8.7
Oct.	4,075	127	6.0	18,623	153	5.7	2,015	134	5.6	3,850	192	4.7
Ave.	7,002	219	147.0	31,595	259	143.0	3,133	209	141.6	6,797	339	133.3
Per cent. reduction in size of flock.	54.2%			52.0%			47.4%			57.6%		

TABLE 3—RELATION OF ARTIFICIAL ILLUMINATION AND TIME OF HATCH ON EGG PRODUCTION OF PULLETS

Month	Hatched Before May 1						Hatched After May 1					
	24 Flocks—Lights			83 Flocks—No Lights			22 Flocks—Lights			21 Flocks—No Lights		
	Total number birds	Average size flock	Ave. egg prod. per bird	Total number birds	Average size flock	Ave. egg prod. per bird	Total number birds	Average size flock	Ave. egg prod. per bird	Total number birds	Average size flock	Ave. egg prod. per bird
Nov.	7,286	303	8.5	12,738	153	5.2	4,839	219	3.8	2,944	140	2.5
Dec.	7,160	331	10.4	12,575	151	7.2	4,747	215	9.3	2,865	136	5.4
Jan.	6,992	291	12.0	12,382	149	8.2	4,647	211	12.3	2,805	134	8.5
Feb.	6,896	287	14.2	12,122	146	12.0	4,518	205	13.6	2,767	132	11.5
Mar.	6,727	280	18.7	11,901	143	18.3	4,396	199	16.8	2,709	129	17.3
Apr.	6,401	266	19.3	11,541	139	20.2	4,199	190	16.9	2,639	126	19.2
May	6,088	253	18.7	10,977	132	19.0	3,954	179	17.5	2,567	122	17.2
June	5,626	234	16.4	10,515	127	15.6	3,771	171	15.1	2,370	113	15 1
July	5,211	217	14.9	10,006	125	14.8	3,516	159	13.9	2,081	99	13.9
Aug.	4,771	198	13.8	9,108	109	12.9	3,032	137	12.2	1,827	87	13.7
Sept.	4,237	176	9.7	8,685	107	10.7	2,725	123	9.6	1,749	83	10.0
Oct.	3,733	155	5.4	7,532	91	6.3	2,475	112	6.3	1,695	81	5.1
Ave.	5,927	249	162.0	10,840	131	150.4	3,901	177	147 3	2,418	115	139 4
Per cent. reduction in size of flock.		48.8%			40.5%			48.8%			42.1%	

sufficient time to eat the large amount of feed necessary to nourish a high producer.

Slow Maturing Pullets—These birds will require a little more light and perhaps a wet mash once a day in addition to the dry mash. These birds may need to be hastened to maturity and into production by turning the lights on before they start laying.

Early Hatched Pullets—Lights used on early hatched pullets will reduce the fall molt to a minimum and sometimes eliminate it entirely. Turning the lights on in October, before the molt starts, and making sure that the birds get sufficient grain to maintain their body weight seems to solve the problem.

Late Hatched Pullets—If lights are used to hasten the maturity of birds, it is not wise to feed too much animal protein, as this will have a tendency to develop the birds sexually so that they will start laying before they have attained a desirable size.

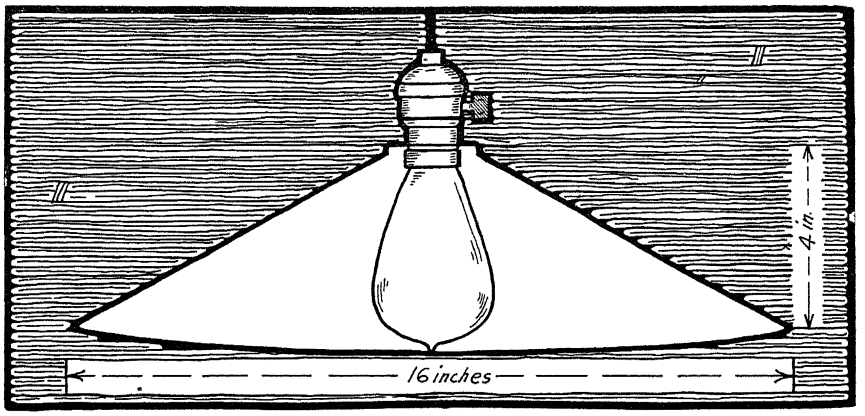

Fig. 2--A lamp reflector of proper dimensions.

EFFECTS OF LIGHTS ON BREEDERS

There are no definite data as to the effect of lights on the breeding flock, but it is generally agreed that turning the lights on breeders that have been molting during November and December is not dangerous, if the lights are not used excessively and not before January 1 to 15, and then used only with the idea of hurrying the breeders back into production.

One experiment station has recommended using lights on late molters after they have stopped laying 2 or 3 weeks to give them a

longer day to change their feathers. However, this practice is not in very general use.

Some poultrymen have tried to use lights on the birds through the entire winter of the second year just the same as used during the first year, and have encountered trouble, not only in the health of the flock, but, also in hatchability of the eggs. It is natural for a hen to have a vacation between the annual laying years, and time should be allowed during which she can recuperate fully, change her feathers, and regain her pigmentation. Failure to do this spells disaster.

Table 4 shows that artificial lights do not increase the yearly egg production when used on old hens, but the lights do increase the production during the winter months.

TABLE 4—RELATION OF ARTIFICIAL ILLUMINATION ON EGG PRODUCTION OF HENS

Month	24 Flocks—Lights			81 Flocks—No Lights		
	Total number birds	Average size flock	Average egg production per bird	Total number birds	Average size flock	Average egg production per bird
Nov.	3,899	162	2 8	11,968	148	2.6
Dec.	3,799	158	3.6	11,737	145	3.1
Jan.	3,691	153	6 2	11,463	142	4.7
Feb.	3,549	147	10.0	11,322	140	8.4
Mar.	3,432	143	14 6	11,055	136	15.5
April	3,207	133	16.6	10,825	133	17.4
May	3,004	125	16.7	10,361	128	16.5
June	2,741	114	14.2	9,923	123	13.8
July	2,618	108	13.8	8,937	110	13.4
Aug.	2,330	97	12.4	8,017	99	12.5
Sept.	2,073	86	8.7	7,395	91	10.0
Oct.	1,819	75	5.1	6,792	84	6.1
Ave.	3,013	125	124.7	9,983	123	124.0
Percent reduction in size of flocks.		53.7%			43.2%	

EFFECT OF LIGHTS ON CONTINUING FALL PRODUCTION

Before the development of the use of lights to increase egg production, there was always a period during the fall, just before the pullets started to lay, when the hens were falling off in production and the income on the average poultry farm was at low ebb and the expense at the peak. The production of pullet eggs at this season also floods

the market with small eggs which make large eggs sell at a good premium.

These conditions have no doubt been in part responsible for the development of the practice of turning lights on the layers the last of August or the first of September and continuing them until November 1, when the lights are suddenly turned off and the birds thrown into a full molt.

Through the summer months the flock should be culled sufficiently to maintain a 50 percent egg production. Many have found that if this has been done, and the lights started September 1, the production level can be maintained during September and October without any additional culling and with no detrimental effects on the flock.

FLOCK MANAGEMENT WITH LIGHTS

The time of year to start lights depends, first, upon the latitude, for the latitude affects the hours of darkness and daylight. In the southern states lights are not used because there are sufficient hours of daylight throughout the year, and because there is but a slight variation in the length of the day.

In addition to this, the age of the birds, their sexual maturity and physical condition, along with whether they will be used as breeders the following spring or not, should determine when and how much light should be used.

It should be distinctly understood that lighting helps solve the feeding problem. By lengthening the hours of daylight and shortening the length of the night during the cold winter months, the birds are given more time in which to consume more food and thus enable them better to nourish their bodies. This increase in food consumption provides the birds with more food nutrients from which to manufacture eggs in larger quantities. If no increase in food consumption is secured by the use of lights, no increase in egg production will result.

The first necessity, so far as mash is concerned, is to provide the proper kind and then to provide it in sufficient hopper space. Allow at least 1 foot of hopper space for each five birds. If the birds do not respond with a decided increase in production in from 7 to 10 days, it is wise to feed a wet mash, feeding the regular day mash made crumbly wet with milk. This wet mash should be fed in addition to the day mash, and fed daily at noon in such quantities as the birds will be able to consume in 30 minutes.

Birds under lights should be fed more heavily on grain than birds not under lights. If this precaution is not observed, the birds will lose weight rapidly, due to the heavy egg production, and a molt will

follow. During the winter months at least 14 pounds of grain should be fed daily to 100 birds. For flocks producing excessively, a heavier grain consumption is desirable.

The method of distributing the grain feedings during the day is a matter of individual taste, but the plan shown in Table 5 is in quite universal use.

TABLE No. 5—GRAIN FEEDING SCHEDULE.

Time of Feeding	Method of Lighting: Morning and Evening	Morning	Evening	Evening Lunch
MORNING	When lights go on 3 or 4 lbs. to each 100 birds.	When lights go on 3 or 4 lbs. to each 100 birds.	3 or 4 lbs. to each 100 birds at daylight.	3 or 4 lbs. to each 100 birds at daylight.
NOON	3 or 4 lbs. to each 100 birds (*optional*)	3 or 4 lbs. to each 100 birds (*optional*)	3 or 4 lbs. to each 100 birds (*optional*)	No grain at noon.
EVENING	Feed all grain birds will consume one hour before lights are turned off.	Feed all grain birds will consume in time to permit consumption before darkness.	Feed all grain birds will consume one hour before lights are turned off.	Feed 3 or 4 lbs. per 100 birds at 4 p.m.
EVENING LUNCH				Feed all grain birds will consume when lights are turned on for evening lunch.

It is a wise plan to scatter the morning feed of scratch in the litter the night before so that it will be ready for the birds when the lights go on, or it will induce them to get up earlier if the lights are not used.

Many poultrymen eliminate the noon feeding of grain and give a wet mash instead. The rate of production should determine which practice is followed.

The evening feeding of grain is given in hoppers by many poultrymen in order to insure ample consumption.

PRECAUTIONS TO OBSERVE IN THE USE OF LIGHTS

1. Make certain that pullets are graded and penned according to age, condition, and laying qualities. Each flock should be handled in a different way.

2. Do not use lights before October 1 to 15, as excessive fall production may make it hard to keep the flock in heavy production during the severe winter months. Often the few eggs gained in the fall by starting the lights early are more than lost by the resulting winter slumps.

3. Never give more than 14 hours of light. Excessive use of lights stimulates over-production and results in a severe slump later, perhaps throwing the flock into a severe molt.

4. When lights are discontinued in the spring, it must be done very gradually. It is only safe to make a maximum change of 10 minutes daily. Discontinuing lights suddenly is certain to produce an unnatural spring molt.

5. Never allow the production to go higher than 55 to 60 percent under lights, as the flock is almost certain to become thin and molt.

6. Do not use lights on hens that are to be used for breeders until January 1 to 15, and then only to help them back into production.

7. Be regular with lights. Lights must be used every day and at the same time each day for best results.

8. Be sure to feed grain liberally. Thinness is sure to result in at least a partial molt.

9. Be sure water and feed is available when lights are turned on.

10. Do not turn lights off too early in the spring.

11. Do not stop feeding early and late in the day when lights are finally eliminated.

TYPE, KIND, LOCATION, DEVICES FOR OPERATING, AND COST OF LIGHTS

The four common sources of light for hens are the barn lantern, gasoline lantern, gas light, and electric lights. Of the four, the electric light, because of the development of farm lighting plants, has become the most popular. It is unquestionably the most efficient, easiest to operate, and best all around kind of light for poultry houses.

The light should be so arranged as to give the maximum amount of light on the floor, but the roosts must be lighted also. Otherwise, the birds will fail to get off the roosts. Recent experiments at Cornell University show that one 40-watt bulb should be used for each 200

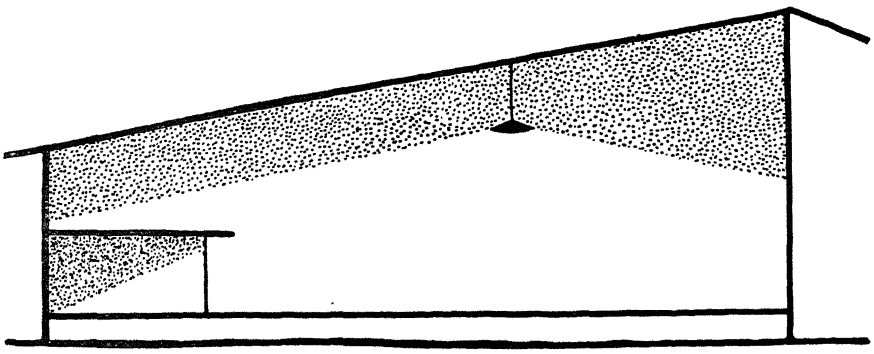

Fig. 3—Lighting units with proper reflectors intensify the light on the floor and dropping boards. Place them 10 feet apart, 6 feet from the floor, and half way from the front of the dropping board to the front of the house.

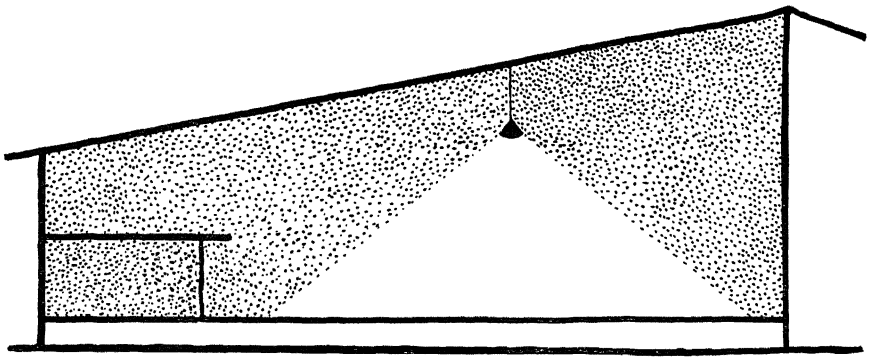

Fig. 4—The result of using a wrong type of reflector. The light in intense on the floor, but the dropping boards are in semi-darkness.

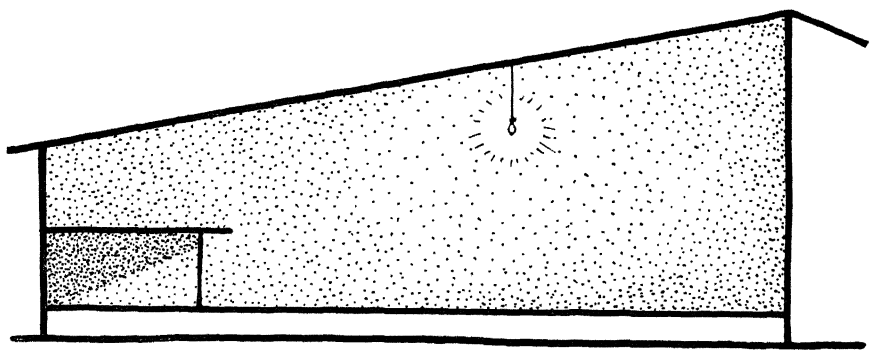

Fig. 5—A light without a reflector produces semi-darkness in the entire pen.

square feet of floor space. Experiments also show that the lights should not be placed more than 10 feet apart.

Height Above the Floor—The best results are secured by using reflectors, as they intensify the light on the floor. The reflector should be 16 inches in diameter and cone shaped, with the cone 4 inches high at the center. For best distribution of lights when reflectors are used, the lights should be suspended 6 feet from the floor, 10 feet apart, and half way from the front of the dropping board to the front of the house.

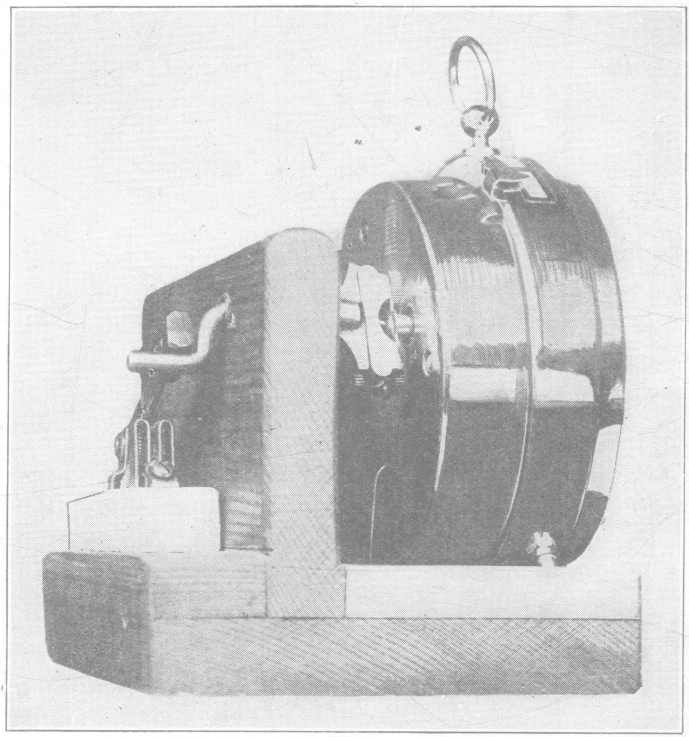

Fig. 6—Homemade time switch. The end of the crank is threaded to receive a ¼-inch wing nut which fits snugly into the slotted winding key of the alarm clock.

Dimming Lights—The lights can be wired with two circuits, using one set of bulbs of very low power. Turning the brighter lights off and the dim lights on will produce semi-darkness and cause the birds to go to bed.

The second system calls for a resistance unit in the circuit, and by increasing the resistance in the coil the lights are dimmed.

Switches—There are any number of good time switches on the market, as well as plans for home-made alarm clock automatic switches.

Cost of Lights—There are few data available as to the cost of artificial illumination, but the available figures show that on farm lighting plants the cost of operation is about 5 cents per bird for the winter period.

CONCLUSION

The use of lights is so closely linked with good breeding, feeding, housing, and management that one cannot be separated from the other. The joint results justify the expense and trouble incurred in the use of lights on the layers.

The tables given in this bulletin are not offered as experimental evidence, but are simply given to show the results secured from artificial illumination by a large number of Ohio poultrymen. The figures in a majority of the tables are from enough flocks so that the averages should be a fair indication of the situation.